

# COUNTRY ANALYSIS BRIEFS

## Japan

Last Updated: September 2008

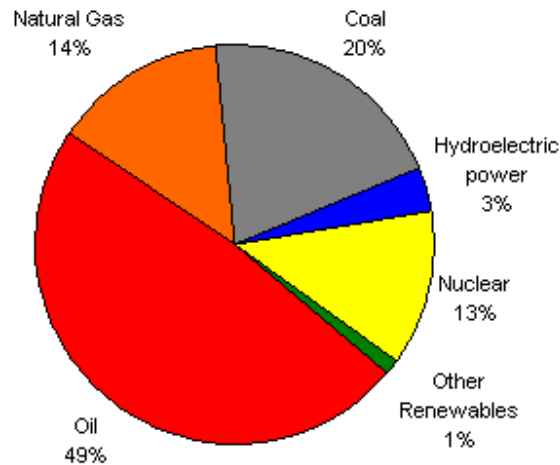
### Background

***Japan is the third largest oil consumer in the world behind the United States and China, and the second largest net importer of oil.***

Japan has virtually no domestic oil or natural gas reserves and is the second-largest net importer of crude oil and largest net importer of liquefied natural gas in the world. Including nuclear power, Japan is still only 16 percent energy self-sufficient. Japanese companies have actively pursued upstream oil and natural gas projects overseas in light of the country's lack of domestic hydrocarbon resources. Japan remains one of the major exporters of energy-sector capital equipment and Japanese companies provide engineering, construction, and project management services for energy projects around the world. Japan has a strong energy research and development program that is supported by the government. The Japanese government actively pursues energy efficiency measures in an attempt to increase the country's energy security and reduce carbon dioxide emissions.



Oil is the most consumed energy resource in Japan, although its share of total energy consumption has declined by about 30 percent since the 1970s. Coal continues to account for a significant share of total energy consumption, although natural gas and nuclear power are increasingly important sources, particularly as Japan pursues environmental policies. Japan is the third largest consumer of nuclear power in the world, after the United States and France. Hydroelectric power and renewable energy account for a relatively small percentage of total energy consumption in the country. Total energy consumption from 2003 to 2030 is forecast to grow by 0.3 percent per year on average, relatively small as compared to China's forecast growth rate of 4.2 percent per year on average, according to EIA data.

**Total Energy Consumption in Japan, by Type (2005)**

Source: EIA International Energy Annual 2005

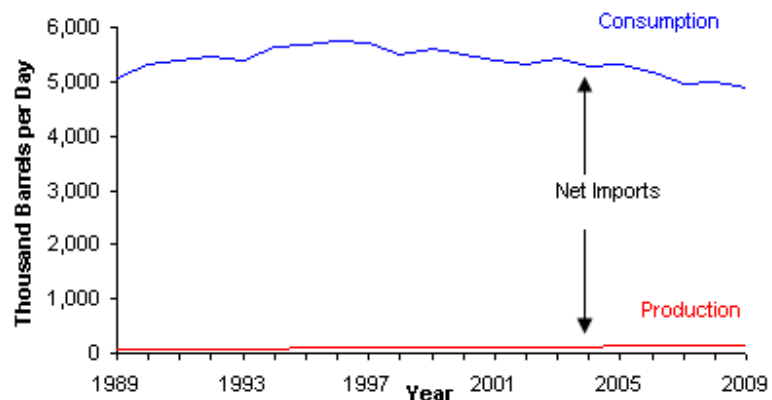
## Oil

***Japan is the third-largest oil consumer in the world, in spite of its limited domestic oil reserves and production.***

Japan has very limited domestic oil reserves and relies almost totally on imports to meet its consumption needs. As of January 2008, Oil & Gas Journal (OGJ) estimated that Japan held approximately 40 million barrels of proven oil reserves. In 2007, Japan's total oil production, including refinery gain, was roughly 130,000 barrels per day (bbl/d), of which just 6,000 bbl/d was crude oil. Total oil production has historically trended upwards and is expected to increase slightly in 2008 and 2009. Japan has 145 producing oil wells in 13 fields, according to OGJ. The vast majority of Japan's oil production comes in the form of refinery gain, resulting from the country's large petroleum refining sector.

Japan maintains government controlled oil stocks to ensure against a supply interruption. Total strategic oil stocks in Japan were 328 million barrels at the end of April 2008, according to the EIA.

Preliminary data indicates that Japan consumed nearly 5 million barrels per day (bbl/d) of oil in 2007, making it the third largest petroleum consumer in the world, behind the United States and China. Oil demand in Japan has declined since 2005 with the exception of a slight projected increase in 2008. EIA forecasts further decline in 2009. This decline stems from structural factors, such as fuel substitution, an aging population and energy efficiency targets. In addition to the shift in the industrial sector to natural gas, fuel substitution is occurring in the residential sector as high prices have decreased demand for kerosene in home heating.

**Japan's Oil Production and Consumption 1989-2009\***

Source: U.S. Energy Information Administration

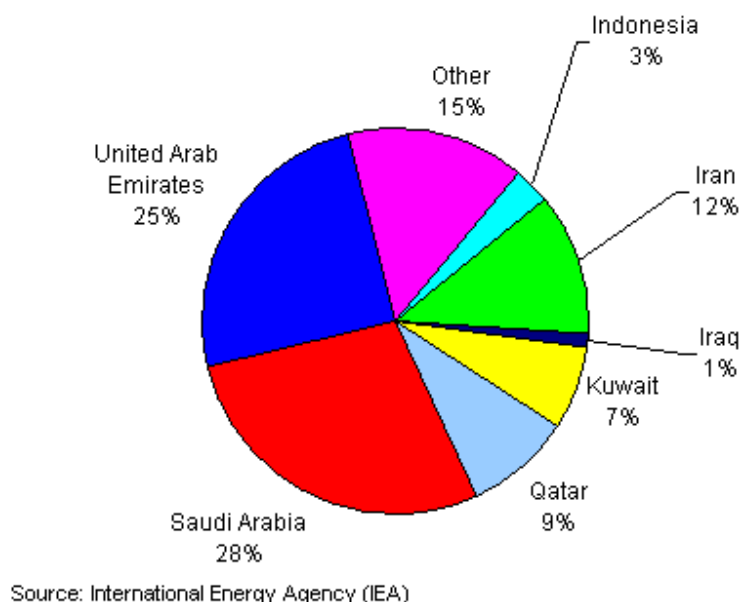
\*2008-09 is forecast

The Japanese government's 2006 New National Energy Strategy emphasizes that the country should reduce the share of oil consumed in its primary energy mix as well as the share of oil used in the

transportation sector. Oil as a percentage of total primary energy demand has fallen from roughly 80 percent of the energy mix in the 1970s to roughly 50 percent today, made possible by increased energy efficiency and the expanded use of nuclear power and natural gas. By 2030, the goal is to reduce this share to 40 percent. This is consistent with Japan's targets for increased energy conservation and efficiency. Among the large developed world economies, Japan has one of the lowest energy intensities, as high levels of investment in research and development of energy technology since the 1970s substantially increased energy efficiency in the country. The industrial sector in particular has become much more efficient.

Due to its gap between domestic consumption and production, Japan remains the second-largest net importer of oil after the United States, having imported just under 5 million bbl/d in 2007. The country is primarily dependent on the Middle East for its oil imports, as roughly 90 percent of Japanese crude oil imports originate in the region, up from 70 percent in the mid-1980s. The country was able to diversify away from the Middle East briefly following the 1973 oil shock but this regional dependency has returned. Japan is currently looking towards Russia, Central Asia, and Africa in order to geographically diversify its oil imports and promote domestic energy security.

**Oil Imports by Source, Japan 2007**



### Sector Organization

Although Japan is not a major oil producing country, it has a robust oil sector, comprised of various state-run, private, and foreign companies. Although the country is open to foreign investment in the energy sector, government restrictions and regulations have historically limited the involvement of international oil companies in Japan.

Until recently, Japan's oil sector was dominated by the Japan National Oil Corporation (JNOC), which was formed by the Japanese government in 1967 and charged with leading oil exploration and production domestically and overseas. In November 2001, then-Prime Minister Koizumi announced the planned breakup of JNOC. The move was part of Koizumi's wider reform agenda, designed to spin off JNOC's profitable business units into new companies and introduce greater competition into Japan's energy sector. Many of JNOC's activities were spun off into the Japan Oil, Gas and Metals National Corporation (JOGMEC) in 2004. JOGMEC is a state-run enterprise charged with aiding Japanese companies involved in exploration and production overseas and the promotion of commodity stockpiling at home. Some of JNOC's most successful business units formed new companies. Two of the largest to be formed through this process are Inpex, now Japan's largest oil company, and the Japan Petroleum Exploration Co., Ltd. (Japex). Both companies carried out successful initial public offerings (IPOs) on the Tokyo Stock Exchange, although the Japanese government maintains an equity stake in each firm.

Private Japanese firms dominate the country's large downstream sector, as foreign companies have faced regulatory restrictions that limit market entry. Over the last several years, these regulations have been eased, which has led to increased competition in the petroleum-refining sector. The country's refiners also went through a long period of consolidation beginning in 1999, which saw the merger of many large downstream companies.

### Exploration and Production

Japan has limited domestic oil reserves and production, concentrated primarily along the country's western coastline. Offshore areas surrounding Japan, such as the East China Sea, contain oil deposits (see [East China Sea Report](#) for more information). However, development of these zones has been held up by competing territorial claims with China (see the [China Country Analysis Brief](#) for more information).

#### *Overseas*

In an effort to mitigate the country's lack of domestic oil resources, Japanese oil companies have sought participation in exploration and production projects overseas. The government's 2006 energy strategy plan urges Japanese companies to increase energy exploration and development projects around the world to secure a stable supply of oil and natural gas. Furthermore, the plan contains the goal of importing 40 percent of the country's oil requirements from Japanese-owned concessions by 2030, up from the current level of about 15 percent.

Japan's overseas oil projects are primarily located in the Middle East and Southeast Asia (see Inpex website for more information on their ongoing projects). Apart from Inpex, Japanese oil companies involved in exploration and production projects overseas include: Cosmo Oil, Idemitsu Kosan Co. Ltd., Japan Energy Development Corporation, Japex, Mitsubishi, Mitsui, Nippon Oil, and others. Many of these companies are involved in small-scale projects that were originally set up by JNOC. However, many of the high profile upstream projects that Japanese firms have pursued abroad have faced obstacles and other setbacks. Below is a table of some of the major investments in overseas projects that Japan has made in recent years.

Country/ Region	Company	Current Share	Oil Fields	Details
Kuwait, Saudi Arabia	Japanese-owned Arabian Oil Company (AOC)	Contract to purchase 100,000 bbl/d from Khafji field until 2023	Neutral Zone, Khafji & Hout fields	AOC served as operator of Khafji and Hout oil fields in the Neutral Zone between Kuwait and Saudi Arabia (also known as the Divided Zone) but lost its concessions in the Saudi portion in 2000 and in the Kuwaiti portion in 2003. AOC remained active in the area under a service contract that began in 2003, but Kuwait declined to renew this contract when it expired in early 2008. Only the purchase contract remains. Japan is still the largest importer of Saudi crude oil in Asia.
Iran	Inpex	10 percent	Azadegan	In 2004, Inpex was awarded a \$2 billion contract to develop the Azadegan oil field, which is estimated to hold 26 billion barrels of oil reserves. Inpex was originally the operator and held a 75 percent stake, but in 2006, the state-owned National Iranian Oil Company (NIOC) slashed Inpex's share to 10 percent and assumed responsibility for operation of the field. Inpex stated that it is not attempting to raise its stake in the project, citing excessive investment costs. The field is expected to produce 150,000-260,000 bbl/d.
Caspian Sea	Inpex	10 percent	Azeri-Chirag, Guneshli (ACG) Project	In 2003, Inpex acquired a 10 percent stake in the ACG Project in Azeri territory of the Caspian Sea. ACG oil fields currently produce around 735,000 bbl/d of oil and are expected to reach 1 million bbl/d in 2009. Estimates of recoverable reserves have been revised upward from 5.4 billion barrels to 9 billion barrels. Inpex is currently involved in the development of the deep-water Guneshli field, which is expected to start production in 2008.
Kazakhstan	Inpex	8 percent	North Caspian Sea Block, Kashagan	Inpex obtained this interest in the offshore oil field in 1998. Production is currently underway and is expected to reach 1.2 million bbl/d.
Russia	Sakhalin Oil and Gas Development Company (SODECO), a consortium of public and private Japanese oil companies	30 percent	Sakhalin-I	Sakhalin-I contains an estimated 2.3 billion barrels of oil and current production has reached 250,000 bbl/d. The Sakhalin projects are increasingly important to Japan as the country tries to geographically diversify its sources of oil imports.
Russia	Mitsui and Mitsubishi	22.5 percent (combined)	Sakhalin-II	Sakhalin-II has estimated reserves of 1 billion barrels of oil.
South America	Frade Japão Petróleo Limitada (FJPL)	18.3 percent	Frade block, Northern Campos Basin	As a joint venture between Inpex and the Sojitz Corporation, FJPL's working interest in this block, off of the coast of Brazil, is the first time a Japanese enterprise has participated in oil production in Brazil. Commercial production is expected to begin in 2009.

As Japan seeks a secure supply of oil, it is carefully observing pipeline developments in neighboring countries. Japan is watching the development of Russian plans to build an oil pipeline from Siberia to the Pacific Coast, for which Russia has yet to choose a final destination. Beijing has lobbied for the "ESPO" (Eastern Siberia-Pacific Ocean) route to pump oil to China, although Russian officials have said they favor a route that would allow exports to both China and Japan. In addition, JOGMEC and the Irkutsk Oil Company recently signed a joint venture agreement to explore the Severo-Mogdinsky oil and gas block in Eastern Siberia, roughly 90 miles south of the ESPO pipeline (see the [Russia Country Analysis Brief](#) and [Sakhalin Island Brief](#) for more information).

#### Downstream/Refining

According to *OGJ*, Japan had 4.7 million bbl/d of oil refining capacity at 31 facilities, as of January 2008, and has the second-largest refining capacity in the Asia-Pacific region after China. The refining sector in Japan has been characterized by overcapacity in recent years, as domestic petroleum product consumption has stagnated. The country began to allow imports of petroleum products in the mid-1990s, which placed additional pressures on Japanese refiners to lower costs and become more competitive.

Today many older facilities are being upgraded and retrofitted with new technologies. In light of domestic overcapacity, refiners are increasingly looking abroad for markets for their petroleum products, especially to China, and some analysts predict that Japan may become a significant exporter of refined products in the long term.

In addition to selling products abroad, Japanese refiners are directly investing in refinery projects overseas. In November 2006, Idemitsu Kosan and Cosmo Oil each acquired a 10 percent equity stake in a new refinery project located in Qatar. The planned facility is expected to have a refining capacity of 146,000 bbl/d and cost of \$800 million and marks the Japanese industry's first overseas refinery investment. Idemitsu Kosan also has a 35.1 percent stake in a new refinery and petrochemical plant being constructed in Vietnam, which will have a capacity of 200,000 bbl/d and cost an estimated \$6 billion to build. The project is expected to come online in 2013. Also involved in the Vietnam project are Kuwait Petroleum International Ltd. (35.1 percent stake), Petrovietnam (25.1 percent stake), and Mitsui (4.7 percent stake).

Japan's Refining Sector as of January 2008		
Company	Number of Refineries	Crude Refining Capacity (bbl/d)
Nippon Oil	6	1,157,000
Idemitsu Kosan	4	608,000
TonenGeneral	3	590,000
Cosmo Oil	4	565,250
Others	14	1,730,450
<b>Total</b>	<b>31</b>	<b>4,650,700</b>

Japan's Largest Refineries		
Operator	Location	Crude Refining Capacity (bbl/d)
Nippon Oil	Negishi	340,000
TonenGeneral	Kawasaki	296,000
Nippon Oil	Mizushima	250,000
Cosmo Oil	Chiba	228,000
Showa Sekiyu	Yokkaichi	205,010
Idemitsu Kosan	Ichihara, Chiba	209,000
Fuji Oil	Sodegaura	192,000
Japan Energy Co.	Mizushima	190,940

Source: OGJ (January 2008)

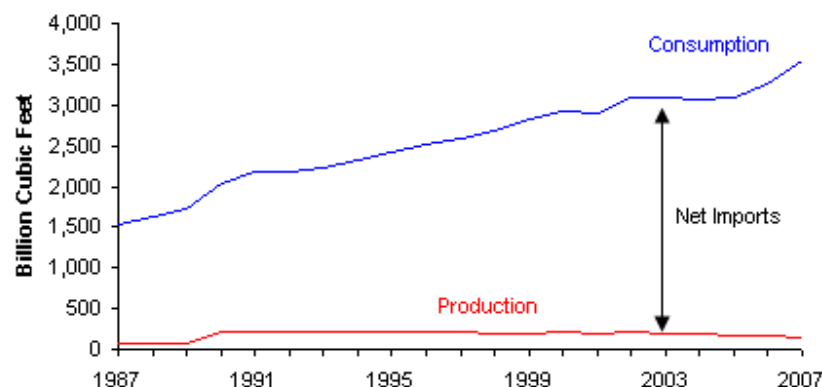
Currently, private refiners in Japan are required to maintain petroleum product stocks worth 70 days of consumption, which imposes large additional costs to these companies.

## Natural Gas

**Japan is the largest importer of liquefied natural gas in the world.**

According to *Oil & Gas Journal* (OGJ), Japan had 738 billion cubic feet (Bcf) of proven natural gas reserves as of January 2008. Natural gas proven reserves have declined since 2007, when they measured 1.4 trillion cubic feet (Tcf), according to OGJ. According to preliminary data, Japan produced 132 Bcf of natural gas in 2007, down slightly from 174 Bcf in 2006.

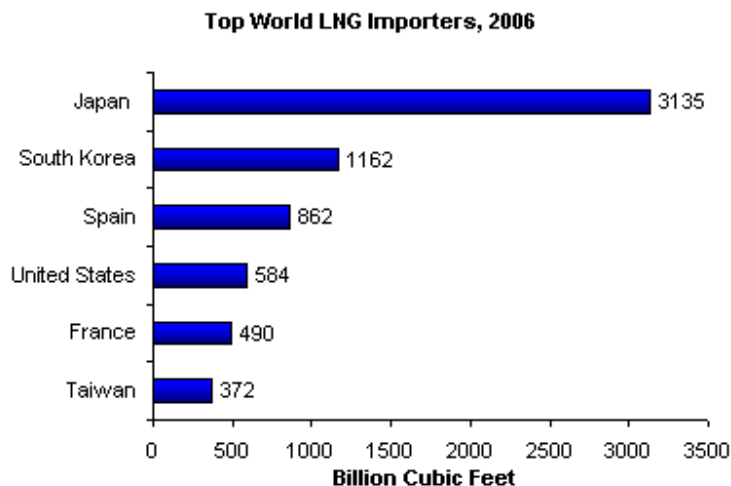
**Japan's Natural Gas Production and Consumption, 1987-2007**



Source: U.S. Energy Information Administration

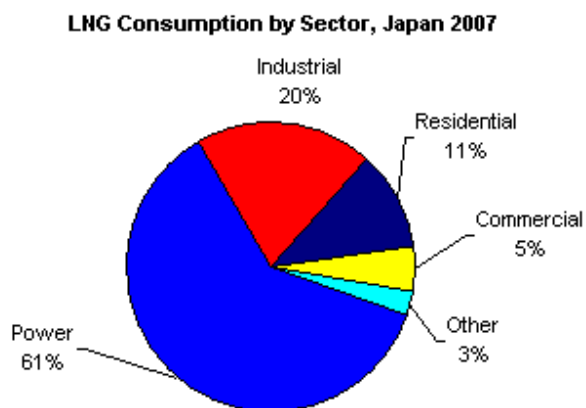


Despite limited natural gas resources, Japan is a large natural gas consumer and must rely on imports for virtually all of its natural gas needs. Lacking international pipeline connections, today Japan is the largest importer of liquefied natural gas (LNG) in the world and currently accounts for about 40 percent of global LNG imports. Preliminary data shows that Japan consumed roughly 3.5 Tcf in 2007, up from about 3.3 Tcf in 2006 and 3.1 Tcf in 2005. In 2006, Japan imported roughly 3.1 Tcf of LNG and reports indicate that in 2007, LNG imports rose by nearly 8 percent. Japan began importing LNG from Alaska in 1969, making it one of the first countries to pioneer LNG trade. Due to environmental concerns, the Japanese government has encouraged natural gas consumption in the country.



Source: U.S. Energy Information Administration

LNG consumption is on the rise in order to make up for fuel-substitution in the industrial sector, lower hydropower capacity, and lower nuclear power capacity, down 17 percent because of maintenance shutdowns and severe earthquake-related damages, according to industry reports. The power sector is the largest consumer of LNG, followed by the industrial sector. Increased use of natural gas within these sectors has been one of the main drivers of growth in natural gas demand in Japan.



Source: FACTS Global Energy Gas Insights, March 2008

### Sector Organization

As in the oil industry, Inpex and the companies created from the former Japan National Oil Company are the primary actors in Japan's upstream natural gas sector. Besides Inpex, various other Japanese companies, including Mitsubishi and Mitsui, are actively involved in natural gas exploration and production efforts, primarily overseas. Osaka Gas, Tokyo Gas, and Toho Gas are Japan's largest retail natural gas companies, with a combined share of about 75 percent of the retail market. Japanese retail companies are also beginning to participate directly in upstream LNG projects, particularly as some supply agreements have been jeopardized by either production delays or shortfalls. Tokyo Gas, for example, has a stake in several natural gas projects in Australia.

Although Japan is a large natural gas consumer, it has a limited domestic natural gas pipeline transmission system. This is partly due to geographical constraints posed by the country's mountainous terrain, but it is also the result of previous regulations that limited investment in the sector. Reforms enacted in 1995 and

1999 have helped open the sector to greater competition, and a number of new private companies have entered the industry since the reforms.

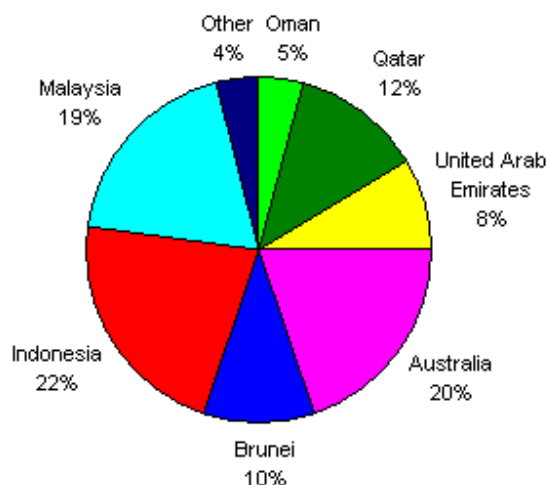
### Exploration and Production

Japan's largest natural gas field Yufutsu, produces approximately 40 million cubic feet per day (Mmcfd) and is managed by Japex. The Iwafune-Oki field, operated by Japex and Mitsubishi, produces around 6 Mmcfd. The East China Sea is believed to hold substantial natural gas reserves and is one possible site of future offshore development by Japan. However, development of hydrocarbon reserves in the region has been hindered by disagreements between Japan and China over the demarcation of their maritime boundary (see [East China Sea Report](#) for more information). Japan has objected to China's exploration and production activities in the Chunxiao natural gas field (also known as the Shirakaba field in Japan), which is three miles west of the median line in the East China Sea, but which Japan contends may be tapping natural gas reserves that extend east of the median line. China does not recognize this median line, as it believes it falls in its exclusive economic zone. The Japanese and Chinese governments participated in several rounds of bilateral negotiations aimed at resolving the impasse, and in June 2008, the two countries reached an agreement on the joint development of the Chunxiao field. The cooperative agreement broadly expressed joint development plans for oil and gas fields in the East China Sea and specifically invites Japan to take a stake in the Chunxiao project and to jointly develop the Longjing field. Although details still have to be worked out, Inpex is a likely investor as its subsidiary, Teikoku Oil, was awarded drilling rights in the area by the Japanese government in 2005.

### Liquefied Natural Gas

Japan is the largest LNG importer in the world and in 2006 imported 3.1 Tcf of LNG, up from 2.8 Tcf in 2004 and 2005. Japan has 24 operating LNG import terminals. Recent plans to increase import capacity include Inpex's proposed \$900 million, 1.5 million ton per year (73 Bcf/y) LNG terminal at Naoetsu port, to come online in 2014. Japan's sources of natural gas imports are more diversified than its sources of oil imports, as the country is dependent on the Middle East for roughly only 22 percent of its LNG imports. Japan imported LNG from 12 countries in 2006, with the largest imports coming from Indonesia, Australia, and Malaysia. Imports from these three countries in 2006 totaled more than 600 Bcf each. Other countries from which Japan imports LNG include Qatar, Brunei, United Arab Emirates (UAE), Oman, the United States, Trinidad and Tobago, Algeria, Egypt, and Nigeria. In addition to long-term contracts, Japan receives a significant number of spot cargoes. A price disparity between spot and long-term cargoes has emerged and spot prices were nearly twice as high as prices of contracted volumes in 2008. Despite the higher price, there has been a surge of spot LNG imports in 2007-2008; according to some analysts this is due to on-going problems with the Kashiwazaki-Kariwa nuclear power plant and thus an immediate need to increase LNG import volumes (see Electricity section for more information).

**LNG Imports by Source, Japan 2006**



Source: U.S. Energy Information Administration

Most LNG terminals are located around the island nation's main population centers of Tokyo, Osaka, and Nagoya. Domestic power companies with natural gas-fired electric capacity own many of Japan's LNG facilities, often in partnership with natural gas distribution companies. These same companies own much of Japan's LNG tanker fleet.

Japanese regulations permit individual utilities and natural gas distribution companies to sign LNG supply contracts with foreign sources, in addition to directly importing spot cargoes. The largest LNG supply agreements are held by Tokyo Gas, Osaka Gas, Toho Gas, Chubu Electric and TEPCO, primarily with countries in Southeast Asia and the Middle East. Many of Japan's existing LNG contracts date from the 1970s and 1980s, when terms were less flexible and tied to prices for crude oil. With these contracts



coming up for renewal, Japanese firms have been pushing for terms more favorable to the buyer, including volume variances and a weakening in the pricing link to crude oil. Many of Japan's LNG agreements are set to expire over the next decade, and it remains uncertain whether or not Japanese companies will be able to renew the contracts on more favorable terms. Some industry analysts suggest that this is driving Japanese firms' interest in acquiring equity stakes in foreign LNG projects, in an effort to guarantee future supply.

Contracted imports remain vital to the country however, which has lead to the renegotiation of long-term supply deals, especially with Japan's largest LNG supplier, Indonesia. In the beginning of 2008, Indonesia and Japan agreed to renew LNG contracts set to expire in 2010-11, which includes an 8.4 million ton per year (409 Bcf/y) deal expiring in 2010 and a 3.2 million ton per year (155 Bcf/y) contract expiring in 2011. However, the contracted volumes are likely to be reduced from the previous agreements as Indonesia faces declining production at home. Indonesia failed to supply 72 cargoes to Japan under the existing contracts over the past two years and is requesting that Japan disregard this shortfall.

New supply deals are also being made as various LNG projects come online. For example, Tokyo Gas and Kansai Electric signed a deal with Australia's Woodside Petroleum Ltd for 3.75 million tons per year (182 Bcf/y) of LNG for 15 years, beginning in 2010, from the company's Pluto natural gas field off of Western Australia. In addition, in 2008, both companies each acquired a 5 percent stake in the Pluto project, leaving Woodside with a 90 percent share. Furthermore, Inpex, TEPCO, and Tokyo Gas hold a combined 20.5 percent stake in the 3.5 million ton per year (170 Bcf/y) Darwin LNG terminal, which came online in 2006. TEPCO and Tokyo Gas have contracted 3 million tons per year (146 Bcf/y) of LNG from the terminal for a period of 17 years.

### Overseas

To help mitigate the country's shortfall of domestic natural gas resources, Japanese companies have actively sought participation in natural gas exploration and production projects abroad. Described below are some of the major upstream projects that Japan is involved in overseas.

#### Australia

- Ichthys Project: Browse Basin, Western Australia (Inpex, 76 percent)
- Mimia Project: Browse Basin (Inpex, 60 percent)
- Timor Sea Joint Petroleum Development Area, including Bayu-Undan gas field (Inpex, Tokyo Gas, and TEPCO, combined 20 percent)
- Griffen fields, Northwestern Australia (Inpex, 20 percent)

Inpex holds a 76 percent stake in the WA-285-P field in the offshore Ichthys natural gas-bearing structure, in addition to holding stakes in a number of adjacent permits. Ichthys is projected to eventually produce 8 million tons per year (390 Bcf/y) of LNG, most of which is reportedly intended for export to Japan. Natural gas reserve estimates at Ichthys were increased in 2008 from 9.5 Tcf to 12.8 Tcf. The project is currently not scheduled to come online until 2014 and will cost an estimated \$6 billion. The decision on where to build the related \$10.7 billion liquefaction plant has not yet been made, but options include Darwin or the Maret Islands off Australia's western Kimberly coast (see the [Australia Country Analysis Brief](#) for more information).

In 2008, Inpex announced that it made a new natural gas discovery in the Mimia-1 well, WA-344-P block in the Browse Basin, roughly 12 miles north of the WA-285-P field. Inpex has held the exploration block since November 2007, when it acquired a 60 percent stake. Total owns the remaining 40 percent. The company is considering linking the development of the Mimia and Ichthys natural gas finds.

#### Russia

- Sakhalin-II (Mitsui and Mitsubishi, 22.5 percent combined)

Although Shell was originally the main operator of Sakhalin-II, with a 55 percent controlling stake, and Japanese companies Mitsui and Mitsubishi, holding 25 and 20 percent stakes respectively, in April 2007 Gazprom became the majority shareholder in Sakhalin-II. Holdings of Shell, Mitsui, and Mitsubishi in the project were reduced to 27.5, 12.5, and 10 percent respectively while Gazprom assumed a 50 percent plus one share stake. The terms of the agreement also included a payout of \$7.45 billion to the foundation stakeholders by Gazprom. In June 2008, the Japan Bank for International Cooperation (JBIC) and a consortium of international commercial banks pledged \$5.3 billion in project financing for the project. At its peak, Sakhalin-II is expected to produce 9.6 Mmt/y (468 Bcf/y) and approximately 60 percent of the project's LNG will be sold to Japan. Nine Japanese companies are planned customers of the project, with one of the more recent deals having been signed in August 2006 between Sakhalin Energy and Chubu Electric for 0.5 million tons per year (24.4 Bcf/y) for a fifteen year period, to begin in 2011.

Other issues with the Sakhalin-II include its estimated cost, which has nearly doubled since initial projections in 2001 to \$20 billion in 2008. In addition, prior to the agreement to dilute the holdings of Shell, Mitsui and Mitsubishi in the project, in 2006, development delays occurred due to problems obtaining environmental permits from the Russian Natural Resources Ministry. Some reports indicate that Sakhalin-II

LNG may not be available until early 2009, instead of mid-2008 as originally planned (see the [Sakhalin Island Analysis Brief](#) for more information).

### Indonesia

- Masela Block, Abadi gas field, Timor Sea (Inpex, 100 percent)
- Senoro LNG plant, Sulawesi (Mitsubishi, 51 percent)
- Mahakam Block and Attaka Unit, Offshore Kalimantan Island (Inpex, 50 percent)

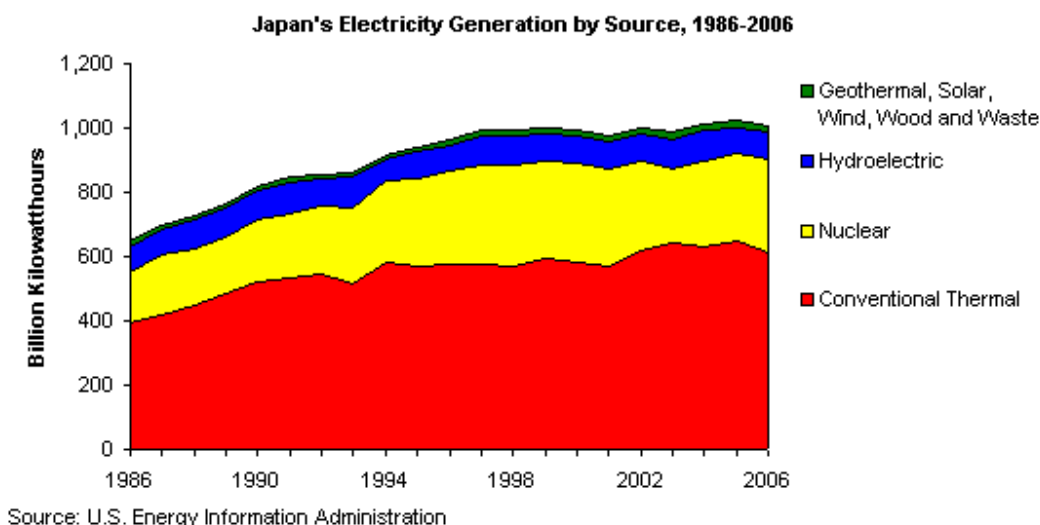
The Abadi field contains an estimated 10 Tcf of natural gas reserves, according to Indonesian officials, and is expected to ship 3-5 Mmt/y (150-250 Bcf/y) of LNG to Japan and elsewhere, starting between 2014-2016. The project will include a floating LNG plant with a capacity of 5 million tons per year. Although Inpex's current contract expires in November, the company expects to receive approval from the Indonesian government to develop the field and a number of international oil companies have expressed interest in working with Inpex to develop the site.

In 2007, Mitsubishi signed a deal with Indonesia's Pertamina to be the majority shareholder (51 percent) of a 2 million t/y (97.4 Bcf/y) LNG plant for the Senoro natural gas block in Sulawesi, Indonesia, which has 1.53 Tcf of proved reserves. The Japanese company will also be the sole buyer of LNG from the plant, which has been rescheduled to come on stream in 2012 due to delays. In addition, for the most part, natural gas from the Mahakam block and Attaka Unit is processed at the Bontang LNG terminal in Indonesia and primarily sold to Japanese refineries and utilities (see the [Indonesia Country Analysis Brief](#) for more information).

## Electricity

**Japan is the world's third-largest producer of nuclear power.**

In 2005, Japan had 247.9 gigawatts (GW) of installed electricity generating capacity, the third largest in the world behind the United States and China. During 2006, Japan generated 1,007 billion kilowatthours (Bkwh) of electric power and consumed 974 Bkwh. Although Japan accounts for the most electricity consumption in OECD Asia, it has the lowest demand growth rate in the region. Of the country's total electric power generation, roughly 60 percent came from conventional thermal sources, 29 percent came from nuclear sources, 9 percent from hydroelectric sources, and 2 percent from other renewables. By 2030, the EIA forecasts that Japan will consume 1,151 Bkwh of electricity.



### Sector Organization

Japan's electricity industry is dominated by 10 privately-owned, integrated power companies that act as regional monopolies, the largest of which is the Tokyo Electric Power Company (TEPCO), which accounts for 32 percent of total power generation in the country. These companies together account for the majority of Japan's electricity capacity and also control the country's regional transmission and distribution infrastructure, leaving limited room for independent power producers (IPPs). Other significant operators in the electricity market are the Japan Atomic Power Company (JAPC), which operates four nuclear power plants and sells electricity to the local power company, and the Electric Power Development Company (known as J-Power), which operates 16 GW of hydroelectric and thermal power plants. J-Power, formerly a state-owned enterprise, was privatized in September 2004.

While Japan's 10 regional power companies are privately owned and subject to some competition, historical regulation of the power sector has guaranteed effective monopolies for the companies. Japan has set out to liberalize and deregulate the electric power sector on a gradual basis.

### Conventional Thermal

In 2005, Japan had about 178 GW of conventional thermal electric generating capacity. The country has a large number of oil-fired power plants, although much of this capacity is primarily reserved as extra capacity to meet peak demand, as approximately only 11 percent of electricity produced in 2005 was from oil-generated. While the use of oil in the power sector has declined, natural gas use in the electric sector has risen substantially. Natural gas-fired power stations are increasing in Japan and roughly 24 percent of electricity is natural gas-fired. Coal remains an important fuel source and is used in a number of power-generating facilities. Coal-fired power generation accounts for approximately 25 percent of electricity in the country, although the Japanese government has encouraged the use of less polluting technologies. Nonetheless, coal is still widely used in power generation, as imports come from outside the Middle East and allow the country to diversify its sources of energy imports. Domestic coal production came to an end in 2002 and today Australia provides nearly 60 percent of coal imports in Japan. New, clean coal technologies are being pursued in the power sector, however, in efforts to meet environmental targets.

### Nuclear

Japan currently has 55 operating nuclear reactors with a total installed generating capacity of around 50 GW, making it the third-largest nuclear power generator in the world behind the United States and France. The government's nuclear energy plans stress maintaining or increasing the percentage of electric power that is nuclear-generated by 2030, which accounted for 29 percent of electric power in 2005. Industry reports indicate that in 2007 this share fell to 26 percent. Preliminary data shows that Japan produced 268 Bkwh of nuclear-generated electricity in 2007.

While Japan has promoted nuclear electricity over the years as a means of diversifying its energy sources and reducing carbon emissions, safety and reliability at many of the country's reactors has been an issue in recent years. In August 2002, it emerged that maintenance inspection findings at some nuclear reactors

owned by TEPCO had not been properly reported to government regulators. This led to the shutdown of all 17 of TEPCO's nuclear reactors over the following several months. Several new reactor projects, including some proposed by other utilities, were put on hold while the issue was resolved. TEPCO gradually brought these units back online by August 2004. However, the most serious problem in nuclear power generation of late occurred in July 2007, when the 6.8 magnitude Chuetsu Offshore Earthquake hit, causing a shutdown of TEPCO's Kashiwazaki-Kariwa nuclear power plant. As much as 8.21 GW of power generation capacity has been lost indefinitely as a result. Inspection and restoration work is ongoing at the plant but there are a variety of safety concerns that must still be addressed. These incidents have empowered a growing anti-nuclear lobby in Japan and TEPCO reportedly will only resume operations if it can obtain community and governmental approval. However, the country's installed nuclear capacity is likely to increase in the long term according to industry reports, as nuclear power plays an important role in meeting the country's environmental goals and electricity demand.

#### *Other*

Japan had installed hydroelectric generating capacity of 22 GW in 2005, or about 9 percent of total capacity. While additional development of hydropower could boost the country's energy security, it is not expected to account for much additional power capacity in coming years and has suffered from some drought conditions recently. Wind and solar power are more actively pursued in the country and installed capacity from these sources has increased in recent years, although they continue to account for a relatively small share of generation at this time.

## Profile

### Energy Overview

<b>Proven Oil Reserves (January 1, 2008E)</b>	40 million barrels
<b>Oil Production (2007E)</b>	130,000 barrels per day, of which 6,000 barrels per day were crude oil.
<b>Oil Consumption (2007E)</b>	5 million barrels per day
<b>Crude Oil Distillation Capacity (2006E)</b>	4.7 million barrels per day
<b>Proven Natural Gas Reserves (January 1, 2008E)</b>	738 billion cubic feet
<b>Natural Gas Production (2007E)</b>	132 billion cubic feet
<b>Natural Gas Consumption (2007E)</b>	3,500 billion cubic feet
<b>Recoverable Coal Reserves (2005E)</b>	396 million short tons
<b>Coal Production (2005E)</b>	None
<b>Coal Consumption (2006E)</b>	206.7 million short tons
<b>Electricity Installed Capacity (2005E)</b>	247.9 gigawatts
<b>Electricity Production (2005E)</b>	1,007 billion kilowatt hours
<b>Electricity Consumption (2006E)</b>	974 billion kilowatt hours
<b>Total Energy Consumption (2005E)</b>	22.6 quadrillion Btus*, of which Oil (48%), Coal (20%), Natural Gas (14%), Nuclear (13%), Hydroelectricity (3%), Other Renewables (1%)
<b>Total Per Capita Energy Consumption (2005E)</b>	177 million Btus
<b>Energy Intensity (2005E)</b>	6,539 Btu per \$2000-PPP**

### Environmental Overview

<b>Energy-Related Carbon Dioxide Emissions (2005E)</b>	1,230.4 million metric tons, of which Oil (53%), Coal (34%), Natural Gas (13%)
<b>Per-Capita, Energy-Related Carbon Dioxide Emissions ((Metric Tons of Carbon Dioxide) 2005E)</b>	9.7 metric tons

<b>Carbon Dioxide Intensity (2005E)</b>	0.4 Metric tons per thousand \$2000-PPP**
<b>Environmental Issues</b>	air pollution from power plant emissions results in acid rain; acidification of lakes and reservoirs degrading water quality and threatening aquatic life; Japan is one of the largest consumers of fish and tropical timber, contributing to the depletion of these resources in Asia and elsewhere
<b>Major Environmental Agreements</b>	party to: Antarctic-Environmental Protocol, Antarctic-Marine Living Resources, Antarctic Seals, Antarctic Treaty, Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Environmental Modification, Hazardous Wastes, Law of the Sea, Marine Dumping, Ozone Layer Protection, Ship Pollution, Tropical Timber 83, Tropical Timber 94, Wetlands, Whaling

## Oil and Gas Industry

<b>Organization</b>	The Japanese government began breaking up former state-owned enterprise Japan National Oil Corporation (JNOC) in 2001. Japan's oil and natural gas sectors are open to foreign involvement, although the government still plays a small role in the industry.
<b>Major Refineries (capacity, bbl/d)</b>	Nippon Oil (Negishi - 340,000; Mizushima - 250,000); TonenGeneral (Kawasaki - 296,000); Cosmo Oil (Chiba - 228,000); Showa Shell Sekiyu (Yokkaichi - 222,000); Idemitsu Kosan (Ichihara, Chiba - 209,000)

\* The total energy consumption statistic includes petroleum, dry natural gas, coal, net hydro, nuclear, geothermal, solar, wind, wood and waste electric power. The renewable energy consumption statistic is based on International Energy Agency (IEA) data and includes hydropower, solar, wind, tide, geothermal, solid biomass and animal products, biomass gas and liquids, industrial and municipal wastes. Sectoral shares of energy consumption and carbon emissions are also based on IEA data.

\*\*GDP figures from OECD estimates based on purchasing power parity (PPP) exchange rates.

## Links

### EIA Links

[EIA - Country Information on Japan](#)

### U.S. Government

[CIA World Factbook - Japan](#)

[Library of Congress Country Study on Japan](#)

[U.S. Embassy in Tokyo](#)

[U.S. State Department Background Notes on Japan](#)

### Foreign Government Agencies

[Japanese Agency for Natural Resources and Energy](#)

[Japanese Ministry of Economy, Trade and Industry](#)

[Japanese Ministry of Foreign Affairs](#)

### Oil and Natural Gas

[Arabian Oil Company, Ltd. \(AOC\)](#)

[Cosmo Oil](#)

[Idemitsu Kosan Co., Ltd.](#)

[Inpex Corporation](#)

[Japan Oil, Gas and Metals National Corporation \(JOGMEC\)](#)

[Japan Petroleum Exploration Co., Ltd. \(Japex\)](#)

[Mitsui Oil Exploration Co., Ltd.](#)

[Nippon Oil Corporation](#)

[Teikoku Oil Co., Ltd.](#)

[TonenGeneral Sekiyu K.K.](#)

### Electricity

[Electric Power Development Company \(J-Power\)](#)

[Federation of Electric Power Companies \(FEPC\)](#)

[FEPC's Electricity Review of Japan, 2005-2006](#)

[Japan Atomic Power Company \(JAPC\)](#)

[Japan Electric Power Information Center](#)

[Nuclear Safety Commission of Japan](#)

[Tokyo Electric Power Company \(TEPCO\)](#)

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World Gas Intelligence

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